10

14a

12

18

16

14b

16

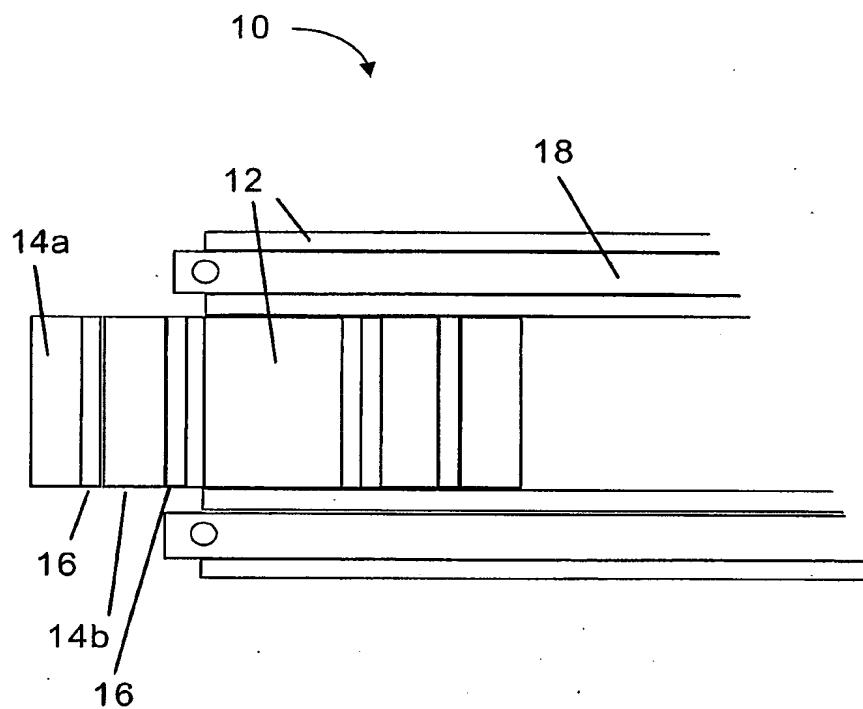Figure 1
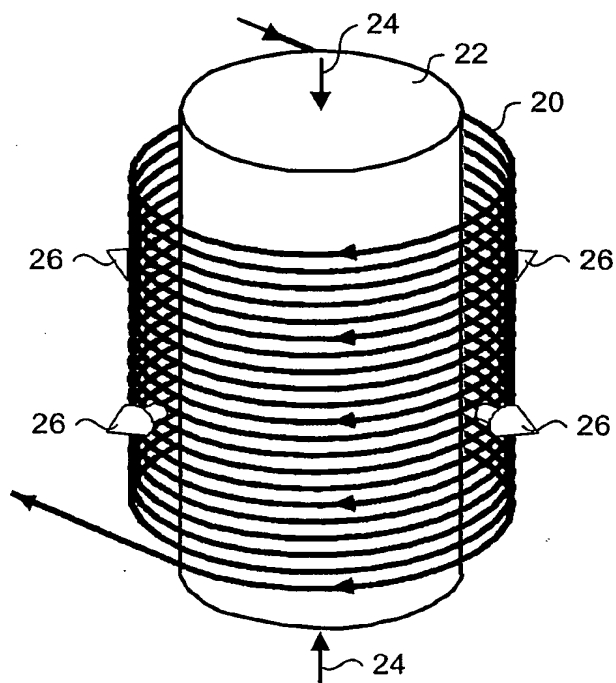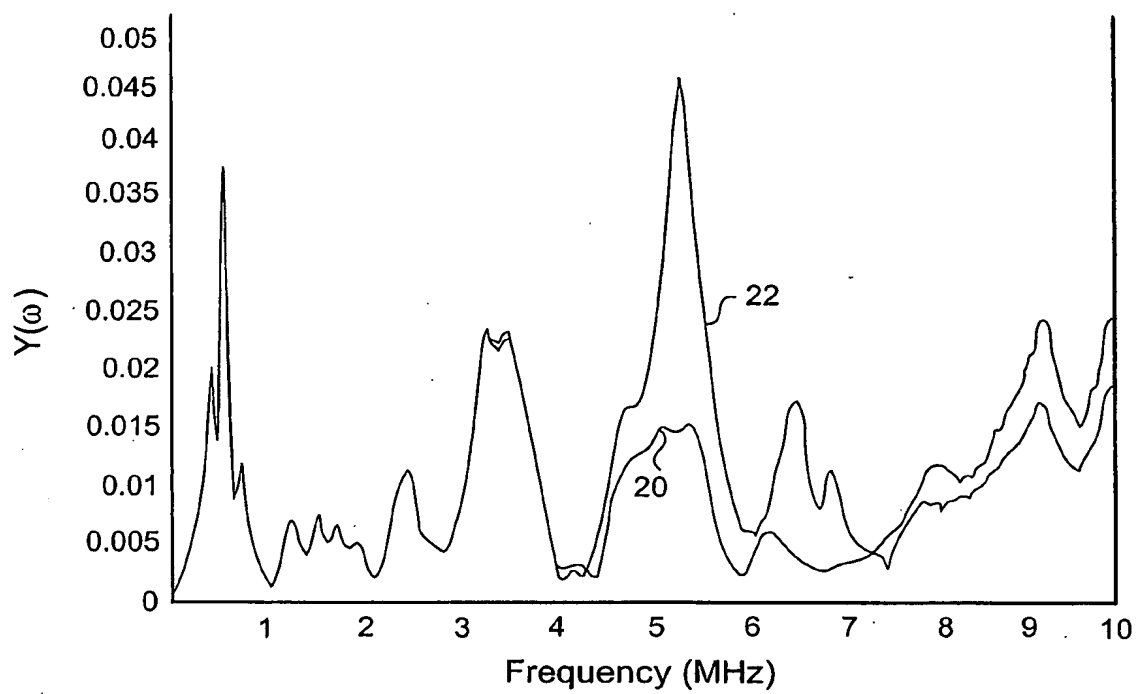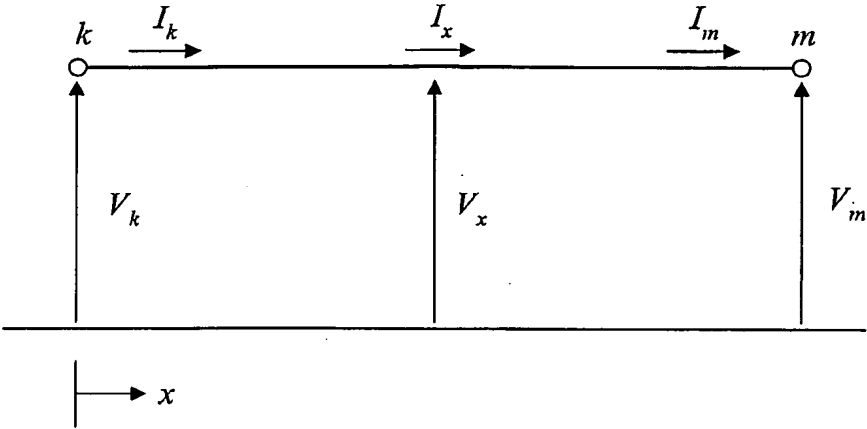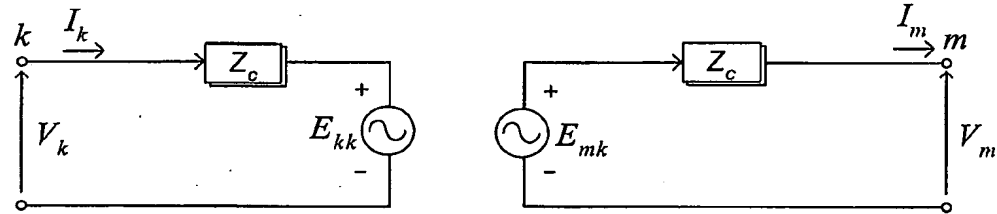
Figure 2

Figure 3

4/12

Figure 4

Figure 5

1 for sensing end
2 for receiving end
coil 1: a1, a2
coil 2: b1, b2
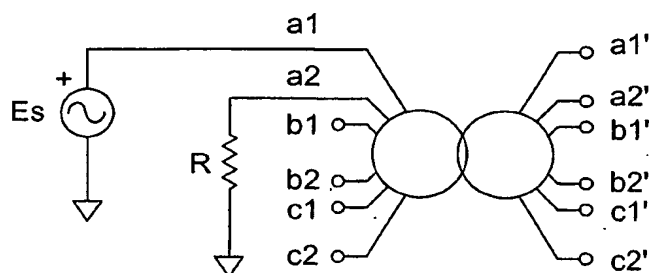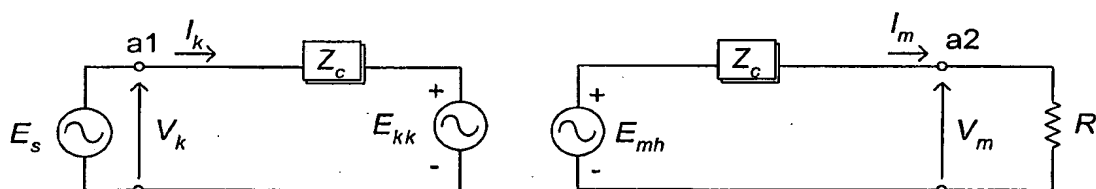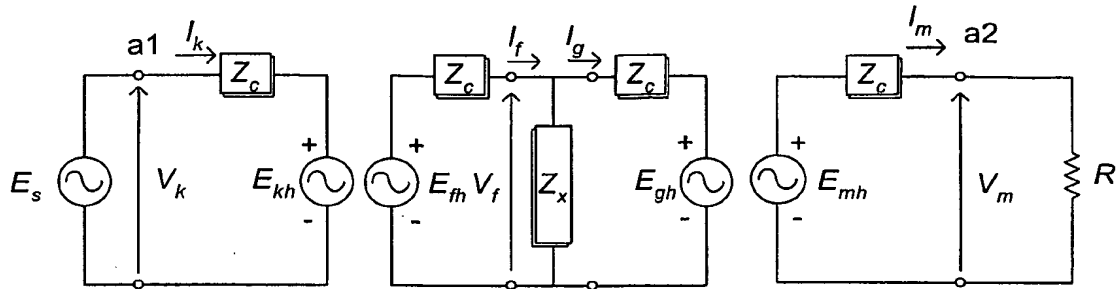coil 3: c1, c2

Figure 6

Figure 7

Figure 8

```
% Matlab script for solving the nonlinear equations
% Define the nonlinear equations
```

$$F1 = V_k - Z_c I_k - (V_f - Z_c I_f) e^{-\gamma_1}$$

$$F2 = (V_k + Z_c I_k) e^{-\gamma_1} - V_f + Z_c I_f$$

$$F3 = (I_m R - I_m Z_c) e^{-(\gamma + \gamma_1)} - \frac{V_f Z_c}{Z_x} - V_f - Z_c I_f$$

$$F4 = (V_f + Z_c I_f - \frac{Z_c V_f}{Z_x}) e^{-(\gamma + \gamma_1)} - I_m R + Z_c I_m$$

```
F = '[F1; F2;F3;F4]';
% Set initial values
x0 = [0; 0;0;0];
options = optimset('Display','iter');
% Solve
[x,fval] = fsolve(F,x0,options)
```
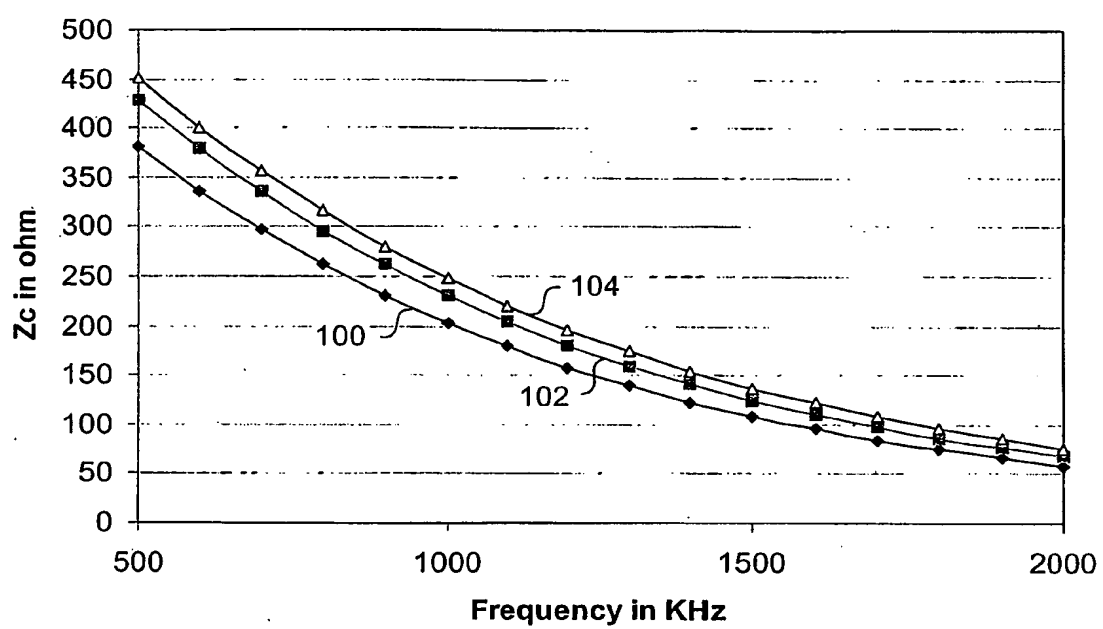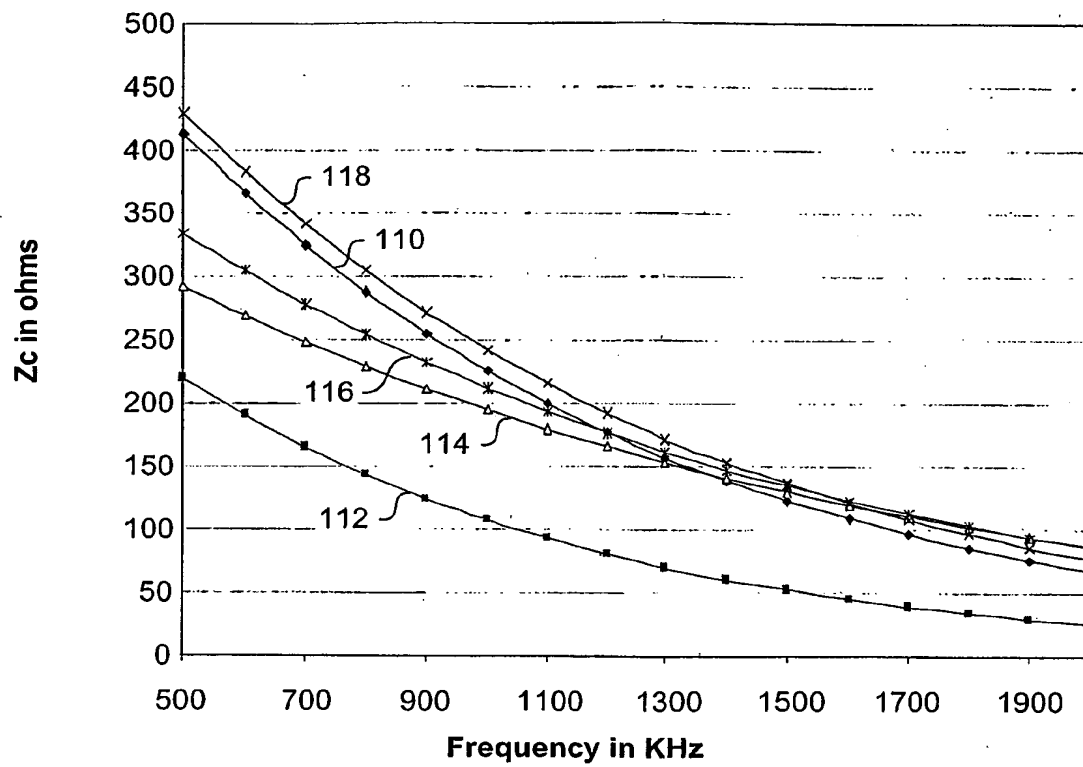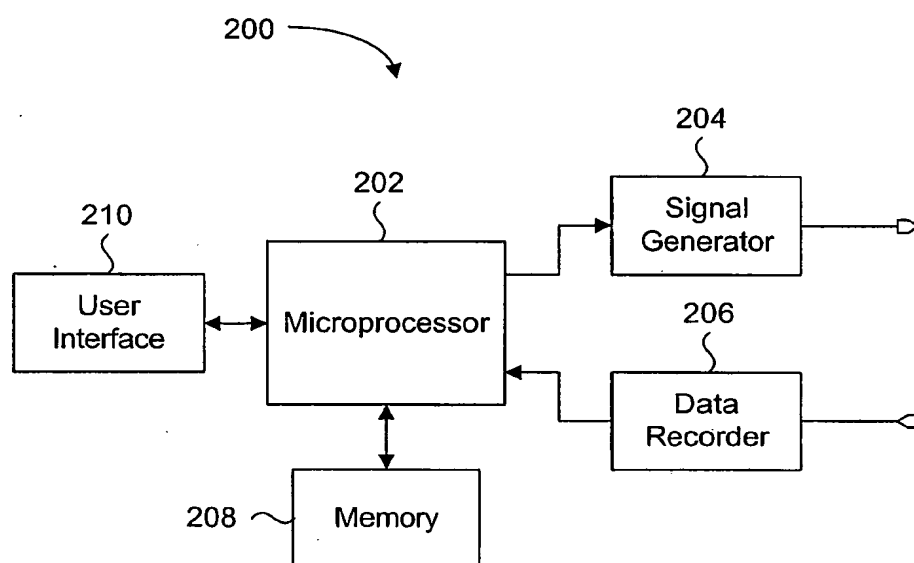
Figure 9

Figure 10

Figure 11

Figure 12

Figure 13

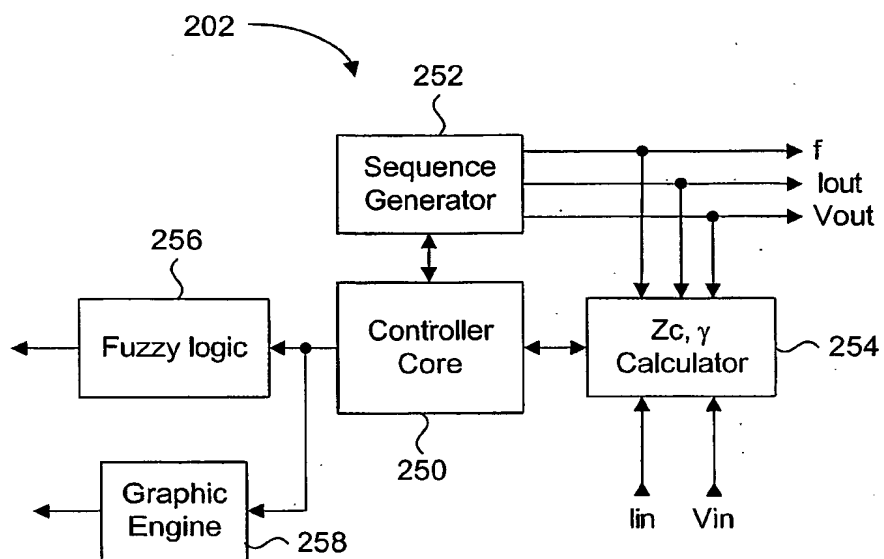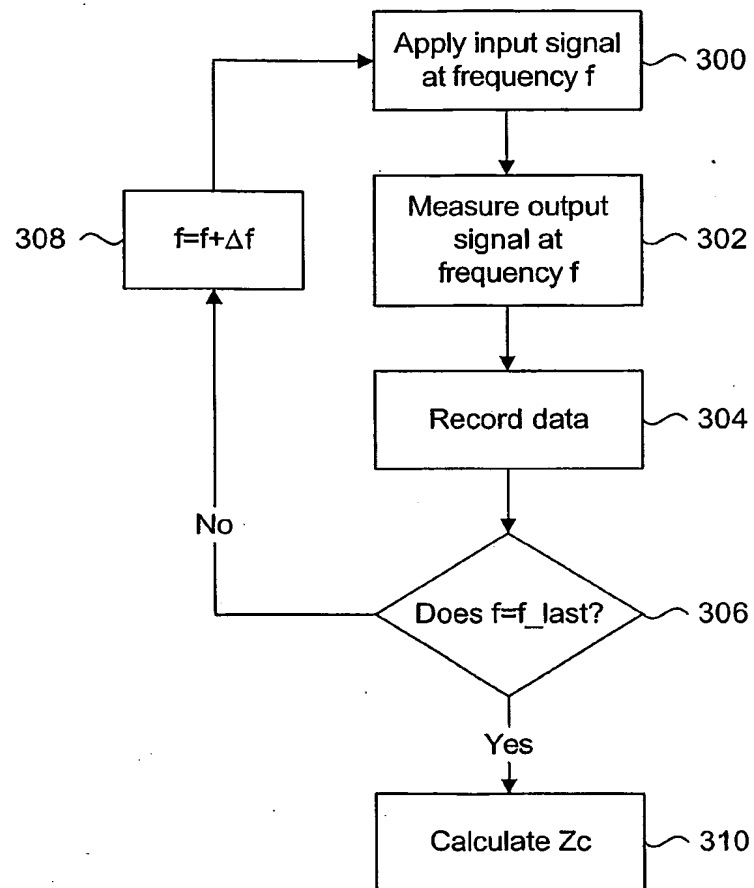Figure 14

Figure 15